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Aortobifemoral Graft Infection: Is Unilateral Limb Excision Definitive?

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Objectives: Aortobifemoral graft (ABFG) infections presenting with single-limb involvement can be managed with unilateral limb excision or complete graft removal. This study aimed to identify factors predictive of subsequent contralateral limb infection in patients initially undergoing unilateral limb excision.

Methods: A retrospective review of patients treated for infected ABFGs from 2001 to July 2014 was performed. Endovascular and aortic tube graft infections were excluded. Primary outcomes were freedom from contralateral graft limb excision, overall survival, and factors potentially predictive of subsequent contralateral limb infection.

Results: Fifteen patients underwent unilateral graft limb excision with retroperitoneal exploration of the affected ABFG limb and revascularization for unilateral graft limb infection. Original indication for placement of the ABFG was aortoiliac occlusive disease in 11 patients and aneurysm in four. No patients had clinical or radiographic evidence for contralateral limb infection at initial presentation. Seven patients, all of whom underwent initial operation for aortoiliac occlusive disease developed contralateral limb infection at a median follow-up of 23.2 months. The remaining eight patients had no evidence of contralateral limb infection at median follow-up of 38.8 months. Patient demographics were similar between the two groups. Five of the seven patients who developed contralateral limb infection had imaging evidence of ipsilateral graft infection above the inguinal ligament at the time of initial graft infection. Operative exploration during unilateral excision in this group revealed a well-incorporated graft without extension to the bifurcation. There was no dominant organism cultured in either group, and duration of targeted antibiotic therapy was similar in both groups ($\geq$6 weeks). For the series, there were no amputations, and overall mortality was 40% with median follow-up of 44.7 months.

Conclusions: Unilateral infection of an ABFG can be managed with single-limb excision; however, 50% of patients will return with contralateral limb infection at a median of 2 years. Clinical assessment of graft incorporation lacks specificity and does not indicate freedom from contralateral limb infection. Factors predicting contralateral involvement include initial operation for aortoiliac occlusive disease and initial imaging or operative findings suspicious for infection above the inguinal ligament of the unilateral limb.

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Percutaneous Endovascular Aortic Repair of Complex Aneurysms Using Large-Diameter Sheaths for Thoracic, Fenestrated, and Branched Endografts

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Objectives: This study reviewed the outcomes of percutaneous endovascular aortic repair (PEVAR) of complex aortic aneurysms using large-diameter sheaths for thoracic, fenestrated, and branched stent grafts.

Methods: We reviewed the outcomes of all consecutive patients who underwent PEVAR of descending thoracic (DTA), thoracoabdominal (TAAA), pararenal (PRA) or aortoiliac aneurysms (AIAs) using large-diameter sheaths for placement of thoracic, fenestrated, or branched stent grafts. Patients treated by fenestrated and branched stent grafts were enrolled in prospective physician-sponsored investigational device exemption protocols. A percutaneous approach was selected in patients with <50% posterior, minimal anterior, or no calcification in the common femoral artery using standardized preclosure technique with two Perclose devices (Abbott Vascular Inc., Redwood City, Calif) in each femoral puncture site. End points were technical success, conversion to open femoral artery repair, 30-day mortality and major adverse events, and freedom from femoral access-site complications.

Results: There were 102 patients treated for 48 PRAs, 27 TAAAs, 19 DTAs, and 8 AIAs. A total of 171 femoral arteries were closed using preclosure technique. Transfemoral sheath size was 18F in four vessels (3%), 20F in 120 (70%), and $\geq$22F in 47 (27%). Eighty-three patients (81%) had visceral branch incorporation, which required brachial artery access using small incision in 48. Technical success for percutaneous transfemoral closure was 95% (162 of 171). Nine intraoperative failures were managed by open femoral conversion using primary repair in six, interposition graft in two, and patch angioplasty in one. Mean estimated blood loss was 444 $\pm$ 569 mL. There were no patients with uncontrolled puncture-related hemorrhage, retroperitoneal hematoma, or intra-operative hypotension. The 30-day mortality was 0.9% (one of 101) and 30-day rate of major adverse events was 15% (16 of 102). Spinal cord injury occurred in one patient (0.9%). Five (3%) access-related complications occurred, including femoral artery occlusion in three and hematoma or pseudoaneurysm in one each. Wound-related complications occurred in one patient (0.5%) who required open femoral artery conversion for exposure and repair. After a mean follow up of 1-year, freedom from femoral access-site complication was 97% $\pm$ 2%.

Conclusions: PEVAR using the preclosure technique is safe and effective in select patients with complex aortic aneurysms who have minimal or no femoral calcifications and require large-diameter sheaths for thoracic, fenestrated, and branched stent grafts. Rate of puncture (3%) and wound-related complications (0.5%) is low, and no uncontrolled puncture-related hemorrhage, retroperitoneal hematoma, or systemic hypotension occurred in this series.

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Left Subclavian Artery Occlusion During Thoracic Endovascular Aortic Repair in the Elderly Is Associated With Significant Morbidity

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Objectives: Covering the left subclavian artery (LSA) during thoracic endovascular aortic repair (TEVAR) for proximal seal is generally safe and well tolerated. The purpose of this study was to determine if this practice is safe in elderly patients.

Methods: The National Surgical Quality Improvement Program (NSQIP) database was queried, from the years 2005 to 2011, to identify patients who underwent TEVAR. Octogenarians were separated into two groups, one where the LSA was covered (C-SA) and another where it was not covered (U-SA). Patient demographics, comorbidities, perioperative data, and outcomes were compared.

Results: There were 392 patients aged >80 who underwent TEVAR, 128 patients in the C-SA group and 264 in the U-SA group. There was no significant difference in demographics or baseline cardiovascular or pulmonary comorbidities between groups. There was also no difference in emergency procedures between C-SA and U-SA groups (27% vs 21%; $P = .18$). The C-SA group had significantly more intraoperative cardiac arrest (4% vs 1%; $P = .03$) and significantly more received intraoperative blood transfusions (32% vs 21%; $P = .02$). There was also a higher postoperative rate of stroke (9% vs 3%; $P = .03$) and sepsis (9% vs 3%; $P < .01$) in the C-SA group compared with the U-SA group.

Conclusions: Covering the LSA in octogenarians is associated with significantly increased perioperative morbidity. We recommend caution when considering coverage of the LCA during TEVAR. These patients may benefit from elective revascularization when possible.

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Development of New Acute Dissection in the Ascending Aorta After Type B Dissection: Intramural Hematoma Is Not Benign

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Objectives: Aortic dissection is a dynamic process that can extend distal to the entry tear or proximally in a retrograde fashion. We sought to determine associations for development of new acute type A aortic dissection (ATAD) after type B dissection (TBAD).

Methods: We reviewed our aortic dissection database for cases of ATAD from 2002 to 2013 that had known TBAD. Imaging and intraoperative reports were used to determine presence of entry tear with dissection

flap vs intramural hematoma (IMH). Demographic and disease-related variables were analyzed.

Results: Among 419 new cases of ATAD, we identified 16 patients (3.8%) with previous known TBAD. Presence of flap vs IMH could be determined in 403 of 419 cases (96%). IMH was more common in patients with previous TBAD (56% vs 13%; $P < .001$). Previous thoracic (six of 16 [38%]; $P < .001$) and abdominal aortic surgery (four of 16 [25%]; $P = .004$) was also more common. There were two cases each of open and endovascular repair of the descending thoracic aorta (Fig) and two cases of open thoracoabdominal aortic repair. On multivariate regression analysis, IMH and previous aortic surgery were associated with new ATAD ($P < .004$). In-hospital mortality after ATAD repair in TBAD patients occurred in one of 16 (6%).

Conclusions: Patients with IMH of the descending thoracic aorta may develop new dissection in the ascending aorta. Not surprisingly, in patients with TBAD and new ATAD, there was an association with previous aortic surgery. Surveillance of the ascending aorta is mandatory in all patients with TBAD.

Fig. A new type A dissection in a patient initially treated with thoracic endovascular aortic repair (TEVAR) for type B dissection.

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Infraclavicular First Rib Resection for the Treatment of Acute Venous Thoracic Outlet Syndrome

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Objectives: Venous thoracic outlet syndrome (VTOS) most commonly is treated by transaxillary, supraclavicular, or paraclavicular approaches based on surgeon preference. However, we have adopted an infraclavicular approach to VTOS because the surgical pathology is in the anterior costoclavicular space. We hypothesize that this approach for thoracic outlet decompression provides excellent access to the costoclavicular space and the axillosubclavian veins for safe and effective treatment of patients with an acute presentation of VTOS.

Methods: We retrospectively reviewed all consecutive patients who underwent infraclavicular thoracic outlet decompression for an acute presentation of VTOS from July 2005 to February 2014 by a single surgeon. Acute presentation was defined as <14 days between the onset of symptoms and catheter-directed thrombolysis (CDT). Demographics, primary and secondary subclavian vein patency, perioperative outcomes, and reinterventions were recorded.

Results: Thirty patients (60% male) underwent an infraclavicular approach for treatment of VTOS. Average age was 33 years. All patients underwent CDT and subsequent infraclavicular first rib resection and intraoperative venography, which was technically successful in all patients. Intraoperative subclavian vein angioplasty was performed in 70%. Median postoperative length of stay was 2 days (range, 2-6 days), blood loss was 75 mL (range, 20-200 mL), and operative time was 117 minutes (range, 76-166 minutes). Median follow-up was 78 days (range, 2-483 days). Ultrasound imaging at follow-up was performed in 24 of 30 (80%), with all patients having patent subclavian veins at last follow-up. Reinterventions included two cases for rethrombosis and one case of hemothorax. There were no complications of brachial plexus or phrenic nerve injury. All patients at last follow-up were symptom free and subclavian veins were patent.

Conclusions: An infraclavicular approach is a safe and effective treatment for acute VTOS. It provides excellent access to the costoclavicular space for first rib resection and subclavian venolysis, while at the same time minimizes the risk of brachial plexus and phrenic nerve injury.

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Clinical Results of Single Versus Multiple-Vessel Infrapopliteal Intervention

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Objectives: The effects of concomitant endovascular interventions on multiple infrapopliteal vessels are not well known, and the long-term sequelae of such procedures have not been reported.

Methods: From 2004 to 2014, 673 patients underwent an infrapopliteal endovascular intervention for tissue loss (77%), rest pain (13%), stenosis of a previously treated vessel (5%), acute limb ischemia (3%), or claudication (2%). Data collected included renal artery stenosis (RAS) events (revascularization, major amputation, or stenosis [>3.5× step-up by duplex]) and wound healing. Patients without an initial indication of critical limb ischemia (CLI) were excluded. Patients were characterized by single-vessel infrapopliteal interventions and multiple-vessel infrapopliteal interventions. Worsened Rutherford class between index procedure and failure was also noted.

Results: Of the 673 patients, 596 underwent an infrapopliteal endovascular intervention for CLI: 85% for tissue loss and 15% for rest pain. During a single procedure, 533 (89%) patients underwent a single-vessel intervention, and 63 (11%) underwent a multiple-vessel intervention. Patients undergoing a single-vessel intervention had more commonly experienced a prior ipsilateral endovascular procedure (17% vs 10%; $P = .04$), whereas patients undergoing a multiple-vessel intervention more often suffered from diabetes (78% vs 89%; $P = .03$) and were more often discharged to a rehabilitation facility (33% vs 41%; $P = .04$). Survival analysis revealed no difference in the proportion of patients experiencing a restenosis ($P = .11$). A Cox regression model illustrated that long-term outcomes do not differ between patients undergoing a multiple-vessel intervention vs those undergoing a single-vessel intervention. Among the 596 patients, a RAS event occurred in 284 limbs (48%), and there was no significant difference in the rate of RAS events between single-vessel and multiple-vessel infrapopliteal interventions (48% vs 49%; $P = .84$; Fig). The amputation rate also did not significantly differ between the two groups (14% vs 16%; $P = .71$). In both groups, 8% of RAS patients presented with a worse ischemia class compared with their initial symptoms.

Conclusions: Our data suggest that multiple-vessel intervention does not improve outcomes compared with single-vessel intervention after any infrapopliteal procedure for CLI.

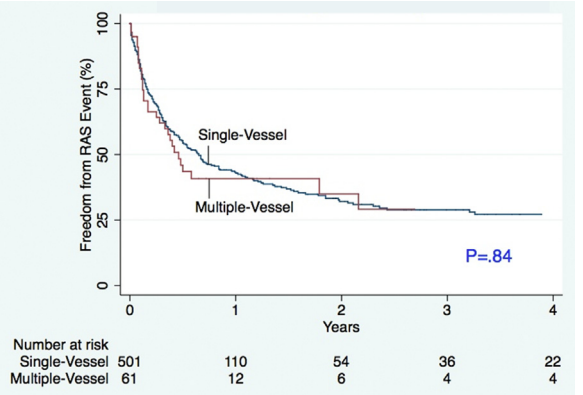

Fig. Kaplan-Meier estimates of revascularization, amputation, and stenosis (RAS) rates between single- and multiple-vessel infrapopliteal interventions.

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